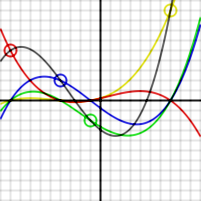


**Term 2 Grade 11 Core Project**

**Due Date: \_\_\_\_\_\_\_\_\_\_**

**The Polynomial Project**



**Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Section: 11.\_\_\_**

**Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Section: 11.\_\_\_**

**(Groups of 2 students only)**

***Introduction:***

The concept of degree of a polynomial is important, because it gives us information about the behavior of the polynomial on the whole. The concept of polynomial functions goes way back to Babylonian times, as a simple need of computing the area of a square is a polynomial, and is needed in buildings and surveys, fundamental to core civilization. Polynomials are used for fields relating to architecture, agriculture, engineering fields such as electrical and civil engineering, physics, and various other science related subjects.

***Approximation by Means of Polynomials***

Many scientific experiments produce pairs of numbers [*x*, *p*(*x*)] that can be related by a formula. If the pairs form a function, you can fit a polynomial to the pairs in exactly one way.

For 2 pairs of numbers you can write a polynomial of degree 1.

For 3 pairs of numbers you can write a polynomial of degree 2.

For 4 pairs of numbers you can write a polynomial of degree 3.

And so on.

*Example*: For the following 4 pairs we can find a polynomial of degree 3.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| *x* | 1 | 4 | 5 | 7 |
| *p(x)* | -5 | 13 | 51 | 211 |

To find the polynomial *p(x):*

1. Substitute the given values into this expression. And find the values of A, B, C, and D

Or

1. We solve the above system by substitution to get:

A=-5, B=6, C=8, and D=1

1. To find the polynomial we substitute the values of A, B, C, D, in

and simplify:

***Task 1***: Find the polynomial that gives the following values

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | -1 | 1 | 2 | 5 |
| p(x) | 10 | -6 | -17 | 82 |

)

1. Write the system of equations in *A, B, C, and* *D* that you can use to find the desired polynomial.
2. Solve the system obtained from part a.
3. Find the polynomial that represents the four ordered pairs.
4. Write the general form of the polynomial of degree 4 for 5 pairs of numbers.

***The Bisection Method for Approximating Real Zeros***

The **bisection method** can be used to approximate zeros of polynomial functions like

*(To the nearest tenth)*

Since *f* (1) = -4 and *f* (2) = 3, there is at least one real zero between 1 and 2.

The midpoint of this interval is 1.5

Since *f*(1.5) = -1.875, the zero is between 1.5 and 2.

The midpoint of this interval is 1.75.

Since *f*(1.75) is about 0.172, the zero is between 1.5 and 1.75.

The midpoint of this interval is 1.625

Since *f*(1.625) is about -0.94. The zero is between 1.625 and 1.75.

The midpoint of this interval is 1.6875.

Since *f*(1.6875) is about -0.41, the zero is between 1.6875 and 1.75.

Therefore, the zero is 1.7 to the nearest tenth.

The diagram below summarizes the results obtained by the bisection method.

******

|  |  |
| --- | --- |
|  |  |

***Task 2***: Find the zeros of the polynomial found in task 1.

1. Show that the 3 zeros of the polynomial found in task 1 are:

First zero lies between -2 and -1

Second zero lies between 0 and 1

Third zero lies between 3 and 4.

1. Find to the nearest tenth the third zero using the Bisection Method for Approximating Real Zeros.

***Task 3***: Real World Construction



You are planning a rectangular garden. Its length is twice its width. You want a walkway w feet wide around the garden. Let x be the width of the garden.

1. Choose any value for the width of the walkway w that is less than 6 ft.

w =

1. Write an expression for the area of the garden and walk.
2. Write an expression for the area of the walkway only.
3. You have enough gravel to cover 1000ft2 and want to use it all on the walk. How big should you make the garden?

***Task 4***: Using Technology:

1. Use a graphing program to graph the polynomial found in task 1
2. Make a PowerPoint to present your project and upload it on a wiki.

Project Rubric Guidelines

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Criteria** | | | | **Points** |
|  | **4** | **3** | **2** | **1** |  |
| **Completeness of Tasks**  **20%** | **Tasks are totally completed and correct. (100%)** | **Tasks are partially completed,**  **OR**  **Partially wrong.(75%)** | **Tasks are partially completed,**  **AND**  **Partially wrong (50%).** | **Tasks are Attempted (25% or less)** | **\_\_\_\_** |
| **Presentation and Integration of Technology**  **70%** | **Students used one mean of technology. The tool used helped the student and was useful to support his project. Moreover, the student was able to explain the work he/she submitted confidently and fluently; he/she was able to answer all of colleagues and instructor’s questions** | **Student used a mean of technology but it was not that supportive to the topic. In addition, student was able to explain the work he/she submitted confidently and fluently and he/she reflected an understanding of his/her works. The student was able to answer most of colleagues and instructor’s questions.** | **Student was able to explain the work he/she submitted. Student reflected a shallow understanding of his/her work; she was able to answer some of colleagues and instructor’s questions,** | **Student use of technology was primitive and way below the level of other IAT students.**  **Student was unable to explain the work he/she submitted. Student reflected no understanding of his/her work; he/she was unable to answer any of colleagues and instructor’s questions.** | **\_\_\_\_** |
| **Creativity& enrichment**  **10%** | **Student had an outstanding addition in all aspects of his/her project.** | **Student had an outstanding addition in some aspects of his/her project.** | **Student had an outstanding addition in very few aspects of his/her project.** | **Student had an outstanding addition in no aspects of his/her project.** | **\_\_\_\_** |
| **This rubric is out of 100, percentage orientation.**  **To make the mark out of 30 (Student’s Mark/10\*3)** | | | | **Total---->** |  |

Good Luck